General

Guideline Title

ACR Appropriateness Criteria® myelopathy.

Bibliographic Source(s)

Roth CJ, Angevine PD, Aulino JM, Berger KL, Choudhri AF, Fries IB, Holly LT, Kendi AT, Kessler MM, Kirsch CF, Luttrull MD, Mechtler LL, O'Toole JE, Sharma A, Shetty VS, West OC, Cornelius RS, Bykowski J, Expert Panel on Neurologic Imaging. ACR Appropriateness CriteriaÂ® myelopathy. Reston (VA): American College of Radiology (ACR); 2015. 10 p. [78 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Seidenwurm DJ, Wippold FJ II, Cornelius RS, Angevine PD, Angtuaco EJ, Broderick DF, Brown DC, Davis PC, Garvin CF, Hartl R, Holly L, McConnell CT Jr, Mechtler LL, Smirniotopoulos JG, Waxman AD, Expert Panel on Neurologic Imaging. ACR Appropriateness Criteria® myelopathy. [online publication]. Reston (VA): American College of Radiology (ACR); 2011. 12 p. [76 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

Recommendations

Major Recommendations

ACR Appropriateness Criteria®

Clinical Condition: Myelopathy

Variant 1: Traumatic.

Radiologic Procedure	Rating	Comments	RRL*
CT spine without contrast	9	This procedure is the first test for acute management.	
MRI spine with and without contrast	4,5,6 May be appropriate; 7,8,9 Usually appropriate	This procedure is used for problem solving or operative planning. It is most useful when injury is not	O Relative Radiation

Rating Scale: 1,2,3 Usually not appropriate;

Radiologic Procedure	Rating	Comments	RRL*
		explained by bony fracture.	
X-ray spine	7	This procedure can be the first test in multisystem trauma, especially when CT is delayed. Flexion and extension views can be used to evaluate instability only if patient is not obtunded.	
X-ray myelography and post-myelography CT spine	5	MRI is preferable.	
MRI spine without and with contrast	2		O
CT spine with contrast	2		
Tc-99m bone scan with SPECT spine	2		
CT spine without and with contrast	1		
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Painful.

Radiologic Procedure	Rating	Comments	RRL*
MRI spine without contrast	8		O
MRI spine without and with contrast	7	This procedure can be used if infection or neoplastic disorder is suspected.	O
CT spine without contrast	7	This procedure is most useful for spondylosis.	
X-ray myelography and post-myelography CT spine	5	This procedure can be used for problem solving or if MRI is unavailable or contraindicated.	
Tc-99m bone scan with SPECT spine	4	This procedure can be used to search for associated extraspinal disease.	
X-ray spine	3	This procedure can be used with flexion and extension views to evaluate instability.	

Radiologic Procedure	Rating	Comments	RRL*
CT spine with contrast	3	Consider this procedure for infection or neoplasm, or if MRI is unavailable or contraindicated.	
CT spine without and with contrast	1		
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 3: Sudden onset or slowly progressive.

Radiologic Procedure	Rating	Comments	RRL*
MRI spine without contrast	9		O
MRI spine without and with contrast	9		O
X-ray myelography and post-myelography CT spine	6		
CT spine without contrast	5		
Arteriography spine	5		Varies
CTA spine with contrast	4		
MRA spine without and with contrast	4	This procedure can be used when vascular pathology is suspected in advance of spinal catheterization.	O
MRA spine without contrast	4	This procedure can be used when vascular pathology is suspected in advance of spinal catheterization when gadolinium-based agents are contraindicated.	O
X-ray spine	3	This procedure may be useful for fracture progression follow-up.	
CT spine with contrast	3		
Tc-99m bone scan with SPECT spine	3		
CT spine without and with contrast	1		
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation

Radiologic Procedure	Rating	Comments	RRL*
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Summary of Literature Review

Introduction/Background

The term myelopathy is used to describe any neurological deficit related to the spinal cord itself. Most frequently, myelopathy is due to compression of the spinal cord by osteophytes or extruded disc material in the cervical spine. Osteophytic spurring and disc herniation may also produce myelopathy localized to the thoracic spine, though this is less common. The next most common causes of myelopathy are spinal cord compression due to extradural masses caused by bone metastases and blunt or penetrating trauma. Many primary neoplastic, infectious, inflammatory, neurodegenerative, vascular, nutritional, and idiopathic disorders can also result in myelopathy, though these are much less common than discogenic disease, metastases, and trauma. A variety of cysts and benign neoplasms can also compress the cord; they tend to arise intradurally. The most common of these are meningiomas, nerve sheath tumors, epidermoid cysts, and arachnoid cysts.

In general, disorders of the spinal cord itself are uncommon and difficult to treat effectively. Therefore, most attention in the radiological evaluation of myelopathy is focused on extrinsic compression of the spinal cord.

Historically, radiological evaluation of myelopathic patients consisted of positive-contrast myelography. Later, this evaluation was supplemented by computed tomography (CT) and CT myelography, and then magnetic resonance imaging (MRI) became the mainstay in the evaluation of myelopathy. Newer investigations of spinal cord diffusion tensor imaging in the setting of myelopathy from trauma, demyelination, and spondylosis appear promising to further interrogate spinal cord injury.

Despite the wide variety of causes of myelopathy, diagnosis and treatment rest on demonstration of mechanical stability of the spine, particularly in the cervical region and when history of tumor, trauma, or prior surgery is present. Depiction of direct neural involvement by a pathologic process is then required for more refined diagnosis and specific treatment decisions. Anatomical diagnosis of myelopathy rests principally on the distinction between extradural, intradural, and intramedullary lesions.

Clinically, the diagnosis of myelopathy depends on the neurological localization of the finding to the spinal cord, rather than the brain or peripheral nervous system, and then to a particular segment of the spinal cord. The antecedent clinical syndrome and other details of the patient's course help to refine diagnosis, but imaging plays a crucial role. Occasionally, symptoms referable to a specific localizing level of the spinal cord can be mimicked by lesions more proximal in the neuroaxis. In general, myelopathy is clinically divided into categories based on the presence or absence of significant trauma, the presence or absence of pain, and the progression of onset (slowly progressive versus a sudden onset). In oncologic patients and those in whom infectious disease is likely, additional imaging tests may be helpful in determining the source and extent of compressive components; however, MRI remains the first-line imaging test for the evaluation of myelopathic symptoms.

Discussion of Imaging Modalities by Variant

Variant 1: Traumatic

In the patient with traumatic myelopathy, the first priority for the spine is assessing its mechanical stability. Radiographs are useful for this purpose, though flexion and extension should be performed only in alert patients and may underestimate the degree of instability, in particular in patients with muscle spasm. Generally, CT is the preferred test when a high probability of bony injury or ligamentous injury is present. At some centers, routine multidetector CT with sagittal and coronal reconstructions is supplanting the role of plain radiographs, especially in the setting of multiple trauma, in particular when spinal reconstructions are generated from chest, abdomen, and pelvis CT imaging without additional radiation exposure to the patient (see the National Guideline Clearinghouse [NGC] summary of ACR Appropriateness Criteria® suspected spine trauma).

MRI is widely considered the study of choice when paralysis is incomplete or under other circumstances where direct visualization of neural or ligamentous structures is clinically necessary. If surgery for herniated disc, hematoma, or other cause of incomplete paralysis is planned, MRI best depicts the relation of pathology to the cord, and it can help predict which patients may benefit from surgery.

Variant 2: Painful

Cervical, thoracic, and lumbar spine central stenosis is a common cause of myelopathy. Factors contributing to spinal stenosis as a cause for myelopathy most frequently include disc spondylosis, vertebral spondylolisthesis, degenerative facet disease, ligamentum flavum hypertrophy, and congenitally short pedicles. Tumors or infections are uncommon causes of spinal stenosis. Clinical myelopathic symptoms of leg weakness alongside low back pain, saddle anesthesia, and urinary retention may indicate lumbosacral cauda equina syndrome (see the NGC summary of ACR Appropriateness Criteria® low back pain).

Radiographs may depict osteophytic narrowing of the spinal canal or bone destruction. CT improves the depiction of both bony encroachment on the spinal canal in cases of fracture or subluxation and compression of neural structures by herniated disc material that is occult on plain radiographic evaluation. Bone destruction and soft-tissue masses are also better seen. MRI has largely replaced CT scanning in the noninvasive evaluation of patients with painful myelopathy because of its superior soft-tissue resolution and multiplanar capability. CT myelography may be supplemental when visualization of neural structures is required for surgical planning or other specific problem solving, though this is less frequent.

Although painful myelopathy is most commonly due to spondylosis and disc herniation, a significant proportion is caused by tumor, infection, demyelinating disease, and syringomyelia. The superior ability of MRI to depict the spinal cord directly and to assess its contour and internal signal characteristics reliably and noninvasively has resulted in general acceptance of MRI as the study of choice in evaluating cervical myelopathy when spondylosis or disc herniation is the most likely cause; intramedullary cord signal changes and diffusivity in spondylotic myelopathy patients represent prognostic factors for neurosurgical outcome. CT myelography may be useful when MRI is contraindicated or not available or to answer specific questions before surgical intervention. In some circumstances involving myelopathy in young children and infants, ultrasound examination of the spine may be useful. Finally, early studies of intraoperative CT scan during cervical decompressive surgery in myelopathic patients show benefit toward ensuring adequate surgical appearance; however, intraoperative CT imaging is not widely available.

Variant 3: Sudden Onset or Slowly Progressive

If myelopathy is painless and slowly progressive, the differential diagnosis is quite broad. Neoplastic disease of the spinal cord and extrinsic compression by epidural or intradural tumors may present in this manner. Demyelinating diseases, degenerative diseases, and metabolic or deficiency diseases may also present this way. Spondylosis may present painlessly as well, particularly in the elderly. In these cases, visualization of the spine as well as the spinal cord is useful, and this is best accomplished noninvasively by MRI.

Vascular processes can present with both sudden onset and slowly progressive myelopathy. Vascular malformations, spinal cord infarct, and epidural hematoma account for most of the vascular lesions of the cord. In practice, they are difficult to distinguish clinically from other nontraumatic causes of myelopathy because the classic history is frequently absent or difficult to elicit from a seriously ill patient.

If arteriovenous malformation (AVM) is considered clinically likely, gadolinium-enhanced MRI or MR angiography (MRA) to demonstrate abnormal vasculature may be useful to guide spinal arteriography and intervention, prioritizing and potentially limiting the number of direct vascular injections. More recently, progress in CT angiography (CTA) has led to its use in preangiographic evaluation of patients with suspected spinal vascular abnormalities. In particular, a search for dural AVMs of the spine can be rewarding, as successful treatment may be achieved using endovascular techniques.

In slowly progressive myelopathy, the ability of MRI to depict the spinal cord noninvasively is most valuable. Some bony anatomy questions and specifically treatable disorders, such as larger intramedullary masses, can be depicted quite well by means of CT myelography. These techniques, however, are less useful than MRI because the distinction between solid and cystic masses is usually not possible, even when delayed examination is performed. The distinction of syrinx from tumor, location of small tumor nodules, extent of cyst, and distinction of nodule and cyst from edema are crucial in treatment planning for intramedullary disease and virtually necessitate MRI. In some cases, vascular imaging by means of MRA or CTA may be indicated if spinal AVMs or dural arteriovenous fistulae are considered to be likely causes; often MRA or CTA would be performed prior to spinal catheter angiography for feeding and draining small vessel localization.

As multiple sites of involvement are possible in oncology and infectious disease patients, it is often beneficial to study the entire spine or skeleton even in the setting of a localized myelopathic level. MRI remains the recommended first-line study for the evaluation and confirmation of myelopathy; however, radionuclide bone scanning can be useful in these patient groups.

Clinical Correlation with Radiologic Findings

An important limitation of MRI in the diagnosis of myelopathy is its low specificity. The ease with which the study depicts expansion and compression of the spinal cord in the myelopathic patient can lead to false-positive examinations and inappropriately aggressive therapy if findings are interpreted incorrectly. For example, transverse myelitis due to demyelinating disease can demonstrate cord enlargement and be mistaken for tumor. Spondylosis, which occurs with normal aging, can be mistaken for clinically significant osteophytic compression of the spinal cord in a patient who is myelopathic for other reasons. These problems are minimized by experienced observers and meticulous clinical correlation with radiologic findings. Similar problems are present in the interpretation of any anatomical study of the spinal cord and are not unique to MRI. Careful

patient selection and clinical correlation are essential in interpretation of imaging findings.

Summary of Recommendations

- CT is usually the preferred first test in suspected spinal trauma.
- MRI is usually the preferred first test in nontraumatic myelopathy. Imaging should be limited to appropriate spinal levels by clinical judgment and physical examination.
- Gadolinium contrast administration is preferred in oncology, infection, inflammation, and suspected vascular causes of myelopathy.
- Spinal angiography (invasive and/or CTA/MRA) is crucial in the evaluation of selected patients with suspected treatable causes of vascular myelopathy.
- In oncologic patients and those in whom infectious disease is likely, additional imaging tests may be helpful in determining the source and extent of compressive components; however, MRI remains the first-line imaging test for the evaluation of myelopathic symptoms.
- No high-quality evidence supports the use of discography, thermography, epidural venography, ultrasound, or cerebrospinal fluid flow studies in the evaluation of myelopathy.

Abbreviations

- CT, computed tomography
- CTA, computed tomography angiography
- MRA, magnetic resonance angiography
- MRI, magnetic resonance imaging
- SPECT, single-photon emission computed tomography
- Tc, technetium

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
	<0.1 mSv	<0.03 mSv
	0.1-1 mSv	0.03-0.3 mSv
	1-10 mSv	0.3-3 mSv
	10-30 mSv	3-10 mSv
	30-100 mSv	10-30 mSv
*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as "Varies."		

Clinical Algorithm(s)

Algorithms were not developed from criteria guidelines.

Scope

Disease/Condition(s)

Myelopathy

Guideline Category

Diagnosis

Evaluation

Clinical Specialty

Internal Medicine

Neurological Surgery

Neurology

Nuclear Medicine

Orthopedic Surgery

Radiology

Intended Users

Advanced Practice Nurses

Health Plans

Hospitals

Managed Care Organizations

Physician Assistants

Physicians

Students

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of imaging modalities for patients with myelopathy

Target Population

Patients with myelopathy

Interventions and Practices Considered

1. Computed tomography (CT), spine
    - Without contrast
    - With contrast
    - Without and with contrast
2. Computed tomography angiography (CTA), spine with contrast
3. Magnetic resonance imaging (MRI), spine
    - Without contrast
    - Without and with contrast
4. Magnetic resonance angiography (MRA), spine
    - Without and with contrast

- Without contrast

5. X-ray
    - Spine
    - Myelography and post-myelography CT, spine
6. Technetium (Tc)-99m bone scan with single-photon emission computed tomography (SPECT), spine
7. Arteriography, spine

Major Outcomes Considered

- Utility of imaging modalities in differential diagnosis
- Sensitivity and specificity of imaging modalities in diagnosis of myelopathy

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Summary

Of the 76 citations in the original bibliography, 23 were retained in the final document. Articles were removed from the original bibliography if they were more than 10 years old and did not contribute to the evidence or they were no longer cited in the revised narrative text.

A new literature search was conducted in December 2013 to identify additional evidence published since the *ACR Appropriateness Criteria® Myelopathy* topic was finalized. Using the search strategy described in the literature search companion (see the "Availability of Companion Documents" field), 177 articles were found. Thirty-one articles were added to the bibliography. One hundred forty-six articles were not used due to either poor study design, the articles were not relevant or generalizable to the topic, the results were unclear, misinterpreted, or biased, or the articles were already cited in the original bibliography.

The author added 22 citations from bibliographies, Web sites, or books that were not found in the new literature search.

Two citations are supporting documents that were added by staff.

Number of Source Documents

Of the 76 citations in the original bibliography, 23 were retained in the final document. After a new search conducted in December 2013, 31 articles were added to the bibliography. The author added 22 citations from bibliographies, Web sites, or books that were not found in the new literature search. Two citations are supporting documents that were added by staff.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Definitions of Study Quality Categories

Category 1 - The study is well-designed and accounts for common biases.

Category 2 - The study is moderately well-designed and accounts for most common biases.

Category 3 - The study has important study design limitations.

Category 4 - The study or source is not useful as primary evidence. The article may not be a clinical study, the study design is invalid, or conclusions are based on expert consensus.

The study does not meet the criteria for or is not a hypothesis-based clinical study (e.g., a book chapter or case report or case series description);

Or

The study may synthesize and draw conclusions about several studies such as a literature review article or book chapter but is not primary evidence;

Or

The study is an expert opinion or consensus document.

Category M - Meta-analysis studies are not rated for study quality using the study element method because the method is designed to evaluate individual studies only. An "M" for the study quality will indicate that the study quality has not been evaluated for the meta-analysis study.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author assesses the literature then drafts or revises the narrative summarizing the evidence found in the literature. American College of Radiology (ACR) staff drafts an evidence table based on the analysis of the selected literature. These tables rate the study quality for each article included in the narrative.

The expert panel reviews the narrative, evidence table and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the variant table(s). Each individual panel member assigns a rating based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the ACR Appropriateness Criteria® Evidence Table Development document (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Rating Appropriateness

The American College of Radiology (ACR) Appropriateness Criteria (AC) methodology is based on the RAND/UCLA Appropriateness Method. The appropriateness ratings for each of the procedures or treatments included in the AC topics are determined using a modified Delphi method. An initial survey is conducted to elicit each panelist's expert interpretation of the evidence, based on the available data, regarding the appropriateness of an imaging or therapeutic procedure for a specific clinical scenario. The expert panel members review the evidence presented and assess the risks or harms of doing the procedure balanced with the benefits of performing the procedure. The direct or indirect costs of a procedure are not considered as a risk or harm when determining appropriateness (additional assumptions regarding rating appropriateness can be found in the document Rating Round Information). When the evidence for a specific topic and variant is uncertain or

incomplete, expert opinion may supplement the available evidence or may be the sole source for assessing the appropriateness.

The appropriateness is represented on an ordinal scale that uses integers from 1 to 9 grouped into three categories: 1, 2, or 3 are in the category "usually not appropriate" where the harms of doing the procedure outweigh the benefits; and 7, 8, or 9 are in the category "usually appropriate" where the benefits of doing a procedure outweigh the harms or risks. The middle category, designated "may be appropriate," is represented by 4, 5, or 6 on the scale. The middle category is when the risks and benefits are equivocal or unclear, the dispersion of the individual ratings from the group median rating is too large (i.e., disagreement), the evidence is contradictory or unclear, or there are special circumstances or subpopulations which could influence the risks or benefits that are embedded in the variant.

The ratings assigned by each panel member are presented in a table displaying the frequency distribution of the ratings without identifying which members provided any particular rating. To determine the panel's recommendation, the rating category that contains the median group rating without disagreement is selected. This may be determined after either the first or second rating round. If there is disagreement after the first rating round, a conference call is scheduled to discuss the evidence and, if needed, clarify the variant or procedure description. If there is still disagreement after the second rating round, the recommendation is "may be appropriate."

This modified Delphi method enables each panelist to articulate his or her individual interpretations of the evidence or expert opinion without excessive influence from fellow panelists in a simple, standardized, and economical process. For additional information on the ratings process see the Rating Round Information document.

Additional methodology documents, including a more detailed explanation of the complete topic development process and all ACR AC topics can be found on the ACR Web site (see also the "Availability of Companion Documents" field).

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

The guideline developers reviewed published a cost analysis.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria (AC).

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are based on analysis of the current medical evidence literature and the application of the RAND/UCLA appropriateness method and expert panel consensus.

Summary of Evidence

Of the 78 references cited in the *ACR Appropriateness Criteria® Myelopathy* document, all of them are categorized as diagnostic references including 4 well designed studies, 9 good quality studies, and 16 quality studies that may have design limitations. There are 48 references that may not be useful as primary evidence. There is one reference that is a meta-analysis study.

While there are references that report on studies with design limitations, 13 well designed or good quality studies provide good evidence.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Selection of appropriate radiologic imaging procedures for evaluation of patients with myelopathy

Potential Harms

An important limitation of magnetic resonance imaging (MRI) in the diagnosis of myelopathy is its low specificity. The ease with which the study depicts expansion and compression of the spinal cord in the myelopathic patient may lead to false-positive examinations and inappropriately aggressive therapy if findings are interpreted incorrectly. For example, transverse myelitis due to demyelinating disease can demonstrate cord enlargement and be mistaken for tumor. Spondylosis, which occurs with normal aging, can be mistaken for clinically significant osteophytic compression of the spinal cord in a patient who is myelopathic for other reasons. These problems are minimized by experienced observers and meticulous clinical correlation with radiologic findings. Similar problems are present in the interpretation of any anatomical study of the spinal cord and are not unique to MRI. Careful patient selection and clinical correlation are essential in interpretation of imaging findings.

Relative Radiation Level

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level (RRL) indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults. Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® Radiation Dose Assessment Introduction document (see the "Availability of Companion Documents" field).

Qualifying Statements

Qualifying Statements

- The American College of Radiology (ACR) Committee on Appropriateness Criteria (AC) and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.
- ACR seeks and encourages collaboration with other organizations on the development of the ACR AC through society representation on expert panels. Participation by representatives from collaborating societies on the expert panel does not necessarily imply individual or society endorsement of the final document.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Living with Illness

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

Roth CJ, Angevine PD, Aulino JM, Berger KL, Choudhri AF, Fries IB, Holly LT, Kendi AT, Kessler MM, Kirsch CF, Luttrull MD, Mechtler LL, O'Toole JE, Sharma A, Shetty VS, West OC, Cornelius RS, Bykowski J, Expert Panel on Neurologic Imaging. ACR Appropriateness CriteriaÂ® myelopathy. Reston (VA): American College of Radiology (ACR); 2015. 10 p. [78 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2015

Guideline Developer(s)

American College of Radiology - Medical Specialty Society

Source(s) of Funding

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

Guideline Committee

Committee on Appropriateness Criteria, Expert Panel on Neurologic Imaging

Composition of Group That Authored the Guideline

Panel Members: Christopher J. Roth, MD (*Principal Author*); Peter D. Angevine, MD, MPH; Joseph M. Aulino, MD; Kevin L. Berger, MD; Asim F. Choudhri, MD; Ian Blair Fries, MD; Langston T. Holly, MD; Ayse Tuba Karaqulle Kendi, MD; Marcus M. Kessler, MD; Claudia F. Kirsch, MD; Michael D. Luttrull, MD; Laszlo L. Mechtler, MD; John E. O'Toole, MD; Aseem Sharma, MD; Vilaas S. Shetty, MD; O. Clark West, MD; Rebecca S. Cornelius, MD (*Specialty Chair*); Julie Bykowski, MD (*Panel Chair*)

Financial Disclosures/Conflicts of Interest

Not stated

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Seidenwurm DJ, Wippold FJ II, Cornelius RS, Angevine PD, Angtuaco EJ, Broderick DF, Brown DC, Davis PC, Garvin CF, Hartl R, Holly L, McConnell CT Jr, Mechtler LL, Smirniotopoulos JG, Waxman AD, Expert Panel on Neurologic Imaging. ACR Appropriateness Criteria® myelopathy. [online publication]. Reston (VA): American College of Radiology (ACR); 2011. 12 p. [76 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Available from the American College of Radiology (ACR) Web site .

Availability of Companion Documents

The following are available:

- ACR Appropriateness Criteria®. Overview. Reston (VA): American College of Radiology; 2015 Oct. 3 p. Available from the American College of Radiology (ACR) Web site .
- ACR Appropriateness Criteria®. Literature search process. Reston (VA): American College of Radiology; 2015 Feb. 1 p. Available from the ACR Web site .
- ACR Appropriateness Criteria®. Evidence table development. Reston (VA): American College of Radiology; 2015 Nov. 5 p. Available from the ACR Web site .
- ACR Appropriateness Criteria®. Topic development process. Reston (VA): American College of Radiology; 2015 Nov. 2 p. Available from the ACR Web site .
- ACR Appropriateness Criteria®. Rating round information. Reston (VA): American College of Radiology; 2015 Apr. 5 p. Available from the ACR Web site .
- ACR Appropriateness Criteria®. Radiation dose assessment introduction. Reston (VA): American College of Radiology; 2015 Sep. 3 p. Available from the ACR Web site .
- ACR Appropriateness Criteria®. Manual on contrast media. Reston (VA): American College of Radiology; 2015. 129 p. Available from the ACR Web site .
- ACR Appropriateness Criteria®. Procedure information. Reston (VA): American College of Radiology; 2015 Jul. 2 p. Available from the ACR Web site .
- ACR Appropriateness Criteria® myelopathy. Evidence table. Reston (VA): American College of Radiology; 2015. 29 p. from the ACR Web site .
- ACR Appropriateness Criteria® myelopathy. Literature search. Reston (VA): American College of Radiology; 2015. 1 p. Available from the ACR Web site .

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI on July 31, 2001. The information was verified by the guideline developer as of August 24, 2001. This summary was updated by ECRI on August 11, 2006. This summary was updated by ECRI Institute on May 17, 2007 following the U.S. Food and Drug Administration (FDA) advisory on Gadolinium-based contrast agents. This summary was updated by ECRI Institute on June 20, 2007 following the U.S. Food and Drug Administration (FDA) advisory on gadolinium-based contrast agents. This summary was updated by ECRI Institute on July 1, 2009. This summary was updated by ECRI Institute on January 13, 2011 following the U.S. Food and Drug Administration (FDA) advisory on gadolinium-based contrast agents. This summary was updated by ECRI Institute on February 28, 2012. This summary was updated by ECRI Institute on January 22, 2016.

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